

NASA SBIR/STTR Technologies

H3.01-9786 - Space Evaporator Absorber Radiator (SEAR) for Thermal Storage on Manned Spacecraft

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Identification and Significance of Innovation

Goal: Efficient thermal control for spacecraft

- Severe environmental conditions e.g., planetary or lunar orbit
- Minimize mass, power, volume, and consumables

Approach: LiCl absorption heat pump technology

- Very high density thermal storage (Over 800 kJ/kg possible)
- Heat pump effect boosts radiator temperature by 30°C

Background: Nonventing thermal control for EVA suits

- SEAR enables heat rejection from PLSS without venting water
- NASA's Space Water Membrane Evaporator (SWME) cools circ water
- Creare's LiCl Absorber Radiator (LCAR) boosts temp and radiates heat
- Successfully achieved TRL 6 in two series of thermal vacuum tests

Estimated TRL at beginning and end of contract: (Begin: 3 End: 4)

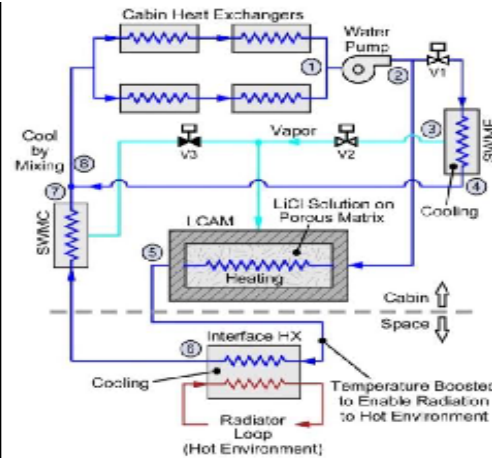
Technical Objectives and Work Plan

Technical Objectives:

- * Compact and lightweight (over 800 kJ/kg thermal storage)
- * Reduced consumables (eliminates most water venting)
- * Demonstrate on International Space Station
 - Design a system for an internal experimental rack

Work Plan:

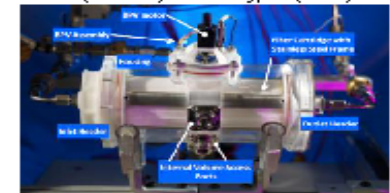
- * Identify requirements for spacecraft thermal control
- * Develop system dynamics model for SEAR system
- * Produce conceptual design for SEAR system
- * Produce conceptual design for SEAR flight experiment



SEAR Provides High Density Thermal Storage (>800 kJ/kg) and Enables High Temperature (50°C) Thermal Radiation



LiCl Absorber Radiator (LCAR) Prototype (2 ft²)



NASA's Space Water Membrane Evaporator (SWME)

NASA Applications

- * NASA application: future manned space exploration
- * Thermal control systems for exploration spacecraft
 - Modified system can be used for heat-driven water vapor management for spacecraft and manned rovers
- * Thermal control for exploration space suits

Non-NASA Applications

- * Terrestrial applications: Heat driven dehumidifiers
 - Vehicular and container-based applications
 - Microclimate cooling systems

Firm Contacts

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NON-PROPRIETARY DATA